



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 10  
1200 Sixth Avenue  
Seattle, Washington 98101

JAN - 8 1993

Mr. Dan Kistler  
President  
United Marine Shipbuilding, Inc.  
1441 N. Northlake Way  
Seattle, Washington 98103

Re: U.S. Environmental Protection Agency and State of Washington,  
Department of Ecology v. Marine Power & Equipment Co. Inc. and WFI  
Industries Inc., Consent Decree, No. C85-382R (W.D. Wash. lodged Nov.  
5, 1987)

Dear Mr. Kistler:

The Environmental Protection Agency (EPA) and Washington Department of Ecology (Ecology) have completed reviewing the Report of Environmental Sampling of the Unimar Yard 1 Dry Dock Facility, Lake Union, Seattle, Washington, prepared by Geo Engineers in partial fulfillment of the above consent decree. Attached please find written comments on the report prepared by Ecology's Sediment Management Unit. EPA fully supports Ecology's comments and its approach to cleanup at the site.

The following is EPA's and Ecology's consolidated review of the extent of Unimar's compliance with the decree's work requirements.

Part IV - REMOVAL AND DISPOSAL OF POLLUTANTS

- A. Establish the physical extent of the deposited debris, providing a chart showing the areas covered by sandblasting debris to a depth of 1 inch or more.

COMMENT - There are inconsistencies in the maps characterizing the extent of the sandblast grit. The maps in the report delineate a smaller area of sandblast grit than earlier maps provided by Marine Power & Equipment dated January 12, 1986 and February 5, 1987. The 1986 map, showing sandblast grit contours, shows a larger area of grit than do recent maps. The 1987 map, which shows the original transect data from which the 1986 contours were drawn, indicates that an even larger area of sediments may contain grit and that



the contours shown on the 1986 map may have been drawn incorrectly. Therefore, the data are inconclusive in determining the area of the sandblasting debris. Please refer to Ecology's comments on page 3, item 4 and page 4, item 1. Unimar has not fully accomplished the requirements of Part IV A. of the decree.

- B. Establish the physical and chemical characteristics of the debris as related to the efficacy of various removal methods.

COMMENT - Although Unimar established the physical and chemical characteristics of the debris from sampling results, the report fails to adequately address these characteristics in relationship to various removal methods. The report does not adequately evaluate the alternatives. The various removal methods that were described in the report were insufficient for the following reasons:

Unconfined open water disposal - Is this an option? If the dredged material is unacceptable according to Puget Sound Dredged Disposal Analysis (PSDDA) guidelines, then this is not an option. The report states that this option may be unacceptable. Either it is or it is not. The report needs to be more definitive on the appropriateness of this method.

Confined Disposal - The report states that this option would require further detailed evaluation to determine suitability. This is probably true, but the report should initially state that based on the chemical and physical results of the sampling and any constraints or requirements, such as those put forth by PSDDA, confined disposal is or is not an option. The report states that no approved confined disposal sites exist (as of September 1991). The question then remains: is this or isn't this an appropriate method? Additionally, the report does not contain any data to support statements regarding the cost of the various methods.

Upland Disposal - The summary section of the report states that this method "is viable" provided that disposal of sediments could be permitted in a landfill. Based on the levels of contaminants found, the report should state whether or not a landfill would accept such waste and if so, what type of landfill would be acceptable (ie., a solid or hazardous waste landfill). A more definitive explanation of the acceptability of this method is necessary. The environmental risk of the disposal and removal methods is not supported by data.

Capping - The report states that this method was "evaluated for environmental significance to demonstrate the negative and positive effects on the water quality and ecosystem of Lake Union". This is inaccurate because the report does not evaluate capping with regard to any substantiated effects supported by data or references. The report should state whether capping is an option based on the physical and chemical characteristics of the debris.

Accordingly, Unimar has not fully carried out Part IV B. of the decree.

- C. Evaluate various methods of removal and disposal to determine both the efficacy and probable costs. Identify the methods to be employed and submit a removal and disposal plan to EPA and Ecology. The plan shall include a detailed time schedule for completion of the work.
- D. Submittal of applications to appropriate authorities with copies to EPA and Ecology applications for any permits, approvals, or authorizations.
- E. Call for bids for removal and disposal pursuant to the approved plan.
- F. Completion of all activities in the approved plan.
- G. Survey conducted to assure not less than 90% removal of the debris has been accomplished and submitted to EPA and Ecology.

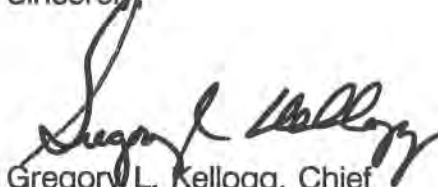
COMMENT - Unimar has not accomplished Parts IV D., E., F., and G. of the decree.

Each of the above requirements contains deadlines which have long since expired. Both agencies acknowledge that some delay may have been unavoidable. Nonetheless, Unimar is not relieved of its obligation to carry out the decree. The agencies believe that it is necessary, at minimum, to modify dates in the decree.

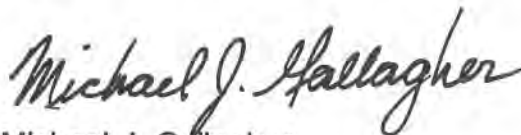
Additionally, Ecology has adopted a narrative sediment management standard (WAC Chap. 173-294) since the decree was lodged. Ecology intends to apply this standard to Unimar's cleanup efforts and use best professional judgment to determine appropriate numerical standards, as outlined in the attached comments. Ecology will take the lead in evaluating Unimar's activities as related to adherence with the State cleanup standards for contaminated sediments.

EPA and Ecology would like to meet with Unimar in order to proceed with carrying out the decree's requirements. Please review the enclosed comments and contact the EPA Project Coordinator, Lisa C. Macchio at (206) 553-1834 to set up the meeting. EPA Assistant Regional Counsel Sharon Haensly has been assigned to the case. The Project Coordinator at Ecology's Northwest Regional Office is Brian Sato (206) 649-7265 and the Assistant Attorney General for the State of Washington is Christina Beusch (206) 459-6134.

Sincerely,



Gregory L. Kellogg, Chief  
Enforcement Section  
U.S. Environmental Protection Agency



Michael J. Gallagher  
Toxics Cleanup Program  
Section Supervisor  
Northwest Regional Office  
Washington State Department of Ecology

cc: David Drelich, U.S. EPA Office of Enforcement  
Steve Novick, U.S. Department of Justice  
Ruth Nelson, attorney for Unimar

October 20, 1992

TO: Lisa Macchio, EPA

FROM: Teresa Michelsen, Ecology

**RE: Approach to cleanup of Unimar site**

This memorandum provides the Sediment Management Unit's comments on the site characterization reports and a recommended approach to cleanup at the Unimar facility, given the following constraints: 1) the existing Ecology-EPA consent decree, 2) the area-wide contamination present in Lake Union, and 3) the lack of numerical freshwater sediment quality criteria. I have reviewed the Unimar reports (FishPro 1991 and GeoEngineers 1991) and the central Ecology files, and have the following conclusions and recommendations for an approach to cleanup at the site. These conclusions and recommendations are provided in the context of the Sediment Management Standards, Chapter 173-204 WAC, which are legally applicable to all sediment cleanups in the state.

Given the lack of adopted chemical freshwater criteria for sediments, the Sediment Management Standards (SMS) narrative standard, which applies to all sediments in Washington State, is applied and interpreted using best professional judgment to determine a sediment cleanup level on a site-specific basis. In addition, the Cleanup Screening Level, used to identify sites for cleanup, is generically defined as a level which does not result in significant human health risk and which causes no more than minor (statistically and biologically significant) acute or chronic adverse effects, as measured using appropriate biological tests. These narrative portions of the rule are interpreted below to provide guidance on interpreting the chemical and biological data collected at the site and on recommending an approach to cleanup at the site.

**Conclusions**

1. **Chemical Data.** The chemical data collected at the site indicate that impacts to the biological community at the site are likely. The chemical concentrations reported for sediments contaminated with sandblast grit at the site (GeoEngineers 1991) substantially exceed freshwater sediment standards and criteria compiled by Ecology that are used in other states and countries. Although Ecology does not endorse any



of these standards at the present time, they are useful as one tool for predicting sediment impacts. Listed on the following page are the maximum concentrations measured at the site of the chemicals that exceed these standards, along with the range of freshwater standards and criteria.

The upper end of the standards range is Canada's provincial sediment quality guidelines that represent "major effects". This effects level is higher than our narrative standards, which allow no more than "minor adverse effects". Therefore, concentrations higher than the high end of the range of standards are considered highly likely to have greater than minor adverse effects. However, because these are not standards that Ecology has adopted, the biological data were reviewed to support this conclusion, as described in the next section.

Metal	Canada's Provincial Sediment Quality Guidelines <sup>a</sup> (mg/kg)		Maximum Concentration <sup>b</sup> (mg/kg)
	"No effects"	"Major effects"	
Arsenic	6.0	33	3,100
Chromium	52	110	230
Copper	16	110	2,300
Lead	31	250	2,900
Nickel	16	75	130
Zinc	120	820	10,000

<sup>a</sup> Canada's Provincial Sediment Quality Guidelines were selected because the theoretical basis for these standards is most similar to the SMS narrative standard.

<sup>b</sup> Observed at Unimar; GeoEngineers (1991).

2. **Bioassay Data.** The sediment bioassay data (FishPro 1991) and the bioassays conducted by EPA (Cummins and Gangmark 1985) confirm the adverse effects predicted by the chemical concentrations in sandblast grit/sediments. In 1985, bioassays conducted using *Daphnia pulex* showed 100% mortality in every sample. In the 1991 data, *Daphnia magna* mortality was not observed, but *Hyalella azteca* mortality ranged from 90-100% at all stations near the site (*Daphnia magna* is not recommended by EILS for freshwater bioassays because of its apparent insensitivity to sediment contaminants; see Bennett and Cabbage 1992).

Near 100% mortality in two of three test organisms is a clear exceedance of the SMS

narrative biological standard of "minor adverse effects". For comparison, the Sediment Quality Standards for marine bioassays are set at levels where no more than 20-30% of the organisms experience adverse effects in a maximum of one biological test. The Cleanup Screening Levels are set at levels where approximately 30-55% (reference mortality + 30%) of the organisms experience adverse effects in one biological test or 20-30% of the organisms experience adverse effects in two biological tests. The bioassay results exceed both of these levels by a wide margin.

3. **Toxicity of Sandblast Grit.** Based on my evaluation of the analyses of the sandblast grit material, the relative elevations of arsenic, copper, lead, and zinc concentrations found in the sediments are related to the presence of sandblast grit in the sediments. Because bioassays of the sandblast grit alone resulted in the same degree of mortality found in the sediments (Cummins and Gangmark 1985), and because the levels of contaminants in the sandblast grit would be predicted to cause significant adverse effects to biological organisms, the presence of sandblast grit in the sediments is likely to be directly responsible for a substantial portion of the toxicity observed in the bioassays.

4. **Exceedance of Cleanup Screening Level.** Because of high concentrations of arsenic, copper, lead, and zinc, and because the contaminated sediments have been demonstrated to be highly toxic to more than one type of organism, it is my conclusion that the sediments present an imminent threat to the aquatic environment at the site and exceed the narrative Sediment Quality Standards and Cleanup Screening Levels for sediments in Washington State at all seven stations tested during the 1991 study. Several of these stations (Stations 3, 5, 6, and 7) are located very near the drydocks, but outside of the area in Figure 2 of GeoEngineers (1991) in which more than one inch of sandblast grit is indicated as having been observed in 1991. Earlier maps, however, show sandblast grit covering areas of sediment not indicated on this map (see attached maps from the Ecology NWRO central files). These data suggest that sandblast grit is present over a larger area than indicated on the 1991 map, or that other contaminants present in the discharge from the shipyard (such as paint chips) are affecting sediment quality in the vicinity of the drydocks.

5. **Petroleum Contamination.** Petroleum contaminants are also present at the site, but at intermediate levels (similar to the range of sediment quality criteria used by other agencies) which, in the absence of freshwater standards, cannot be definitively related to biological effects. In addition, the pattern of petroleum contamination suggests the possibility of an offsite source, either the refueling dock immediately to southwest of the site. The type of hydrocarbons (i.e., aliphatic hydrocarbons) suggests that Gas Works is not a likely source, as that source is associated with high percentages of PAHs.

## Recommendations for Cleanup

1. **Sandblast Grit Cleanup.** At a minimum, the sediments contaminated with sandblast grit must be removed or capped, as stipulated by the consent decree. These sediments present an imminent hazard to the ecological community at the site which is significantly greater than and distinguishable from hazards in other parts of Lake Union. However, the extent of sandblast grit should be more clearly delineated as part of the cleanup plan, particularly in the vicinity of the drydocks, as well as along the shoreline on either side of the site, as there is evidence that sandblast debris (including paint chips and other contaminants present in the spent sandblast grit) may be present in these additional areas based on chemical concentrations, toxicity results, and earlier maps of sandblast grit contours.

2. **Characterization and Cleanup under the Sediment Management Standards.** In addition, it is recommended that the area of sediments demonstrating high levels of toxicity but not necessarily containing sandblast grit in the vicinity of the drydocks be subjected to a more comprehensive cleanup study, as required by the Sediment Management Standards. These sediments may contain paint chips, tributyltin, and/or other contaminants associated with discharges from the drydocks that cause sediment toxicity, alone or in combination with the petroleum contamination present in the eastern portion of the site. These sediments clearly exceed the Cleanup Screening Levels for site identification, as interpreted on a site-specific basis. However, the extent of these sediments, and therefore, the full extent of the site, has not been identified.

As part of the cleanup study, continued use of *Hyalella azteca* would be appropriate; however, it is recommended that use of the *Daphnia* test be discontinued (and a alternative acute bioassay be proposed), and that a chronic bioassay such as Microtox be used to complete the battery of three tests needed to fully address biological effects. These bioassays should be used to identify the boundaries of the area around Unimar associated with a significantly higher level of biological effects than the background level of effects seen in Lake Union.

If these additional sediments are not addressed at this time, the sediment portion of the site that is left unremediated may be subjected to hazard assessment in preparation for site listing and ranking on the Sediment Site List. The sediments at the site will then be subject to further cleanup actions under the Sediment Management Standards and/or the Model Toxics Control Act. Because it is likely that these additional sediments will be reevaluated for cleanup at a later date, there would be substantial efficiency, cost-effectiveness, and benefit to the ecological community to



perform the characterization and remediation of these areas at the same time as the sandblast grit is addressed.

3. **Site-Specific Cleanup Standard.** Chemical or biological site-specific cleanup standards need to be developed for the areas of the site that will be cleaned up. The site-specific cleanup standard may fall between the SQS and MCUL, neither of which has been numerically defined for freshwater sediments. However, the SQS is represented by the narrative standard provided in WAC 173-204-100, which states that surface standards should have "no adverse effects, including no acute or chronic adverse effects on biological resources and no significant health risks to humans". The MCUL is equivalent to a level at which "minor adverse effects" are observed, and is intended to be the same level as the CSL. It is recommended that, in the absence of chemical criteria, a site-specific cleanup standard be derived that is based on a biological response.

As part of the cleanup plan, Unimar should propose a set of biological tests and effects levels that will be used to evaluate compliance with biologically-based site-specific cleanup standards. In developing the effects levels that will be used, it is recommended that the marine biological criteria be used as guidelines for determining the level of biological effects that corresponds to a "minor effects" level, taking into consideration the background levels of biological effects observed in Lake Union.

## References

- Bennett, J. and J. Cubbage. 1992. Evaluation of Bioassay Organisms for Freshwater Sediment Toxicity Testing. Environmental Investigation and Laboratory Services, Washington State Department of Ecology, Olympia, WA.
- Cummins, J.E. and C.E. Gangmark. 1985. Results of Toxicity Tests Conducted on Unused Sandblasting Sands and Sediments Collected Adjacent to Marine Power and Equipment Company Sites on Lake Union and the Duwamish Waterway. U.S. Environmental Protection Agency, Environmental Services Division, Region 10 Laboratory, Manchester, WA.
- FishPro. 1991. Biological Report on Sediment and Water Bioassays and Benthic Community Determination at UNIMAR Yard 1 Dry Dock Facility, Seattle, WA. Prepared for Unimar International, Inc. Port Orchard, WA.
- GeoEngineers. 1991. Report of Environmental Sampling, UNIMAR Yard 1 Dry Dock

Facility, Lake Union, Seattle, Washington. Prepared for United Marine International, Inc. Redmond, WA.

1299-02-4 SEW:KKT 10-24-88

LAKE UNION

N. Northlake Way

Offices and  
Shops

Existing  
Shoreline

Drydock #2

Drydock #9

Drydock #3

Drydock #6

Drydock #8

Property  
Line

doesn't match 1991 report, and

EXPLANATION:

no evidence to support curves marked  
in yellow - see attached  
transsect data

0.5 THICKNESS CONTOUR OF  
SANDBLASTING MATERIAL

REFERENCE:

UNTITLED DRAWING PROVIDED BY MARINE POWER & EQUIPMENT, INC.,  
DATED 1-12-86.

0 100 200  
SCALE IN FEET

Geo  Engineers

DISTRIBUTION OF SANDBLASTING MATERIAL

FIGURE 2

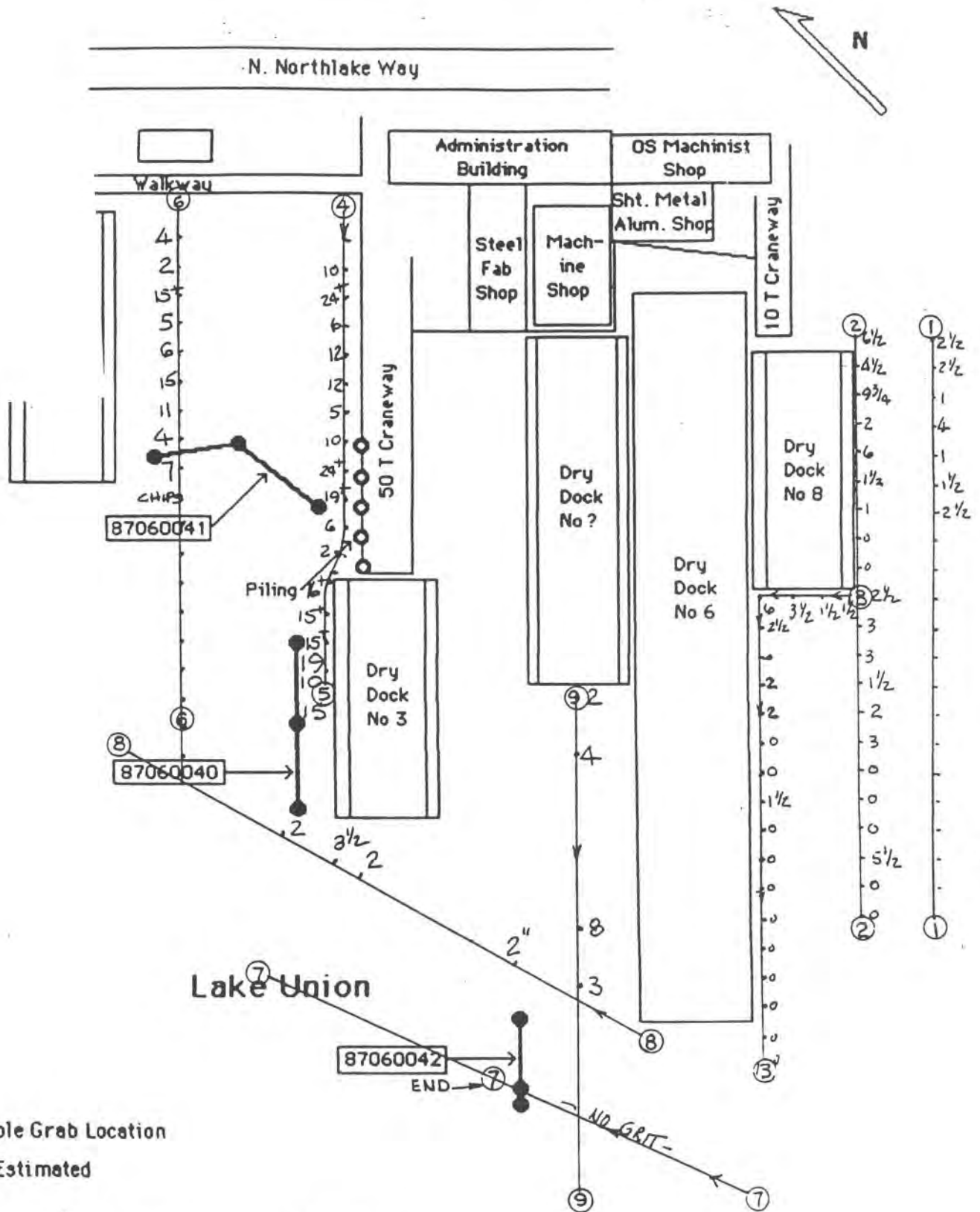


FIGURE 1

depth of debris  
in inches

February 5, 1987

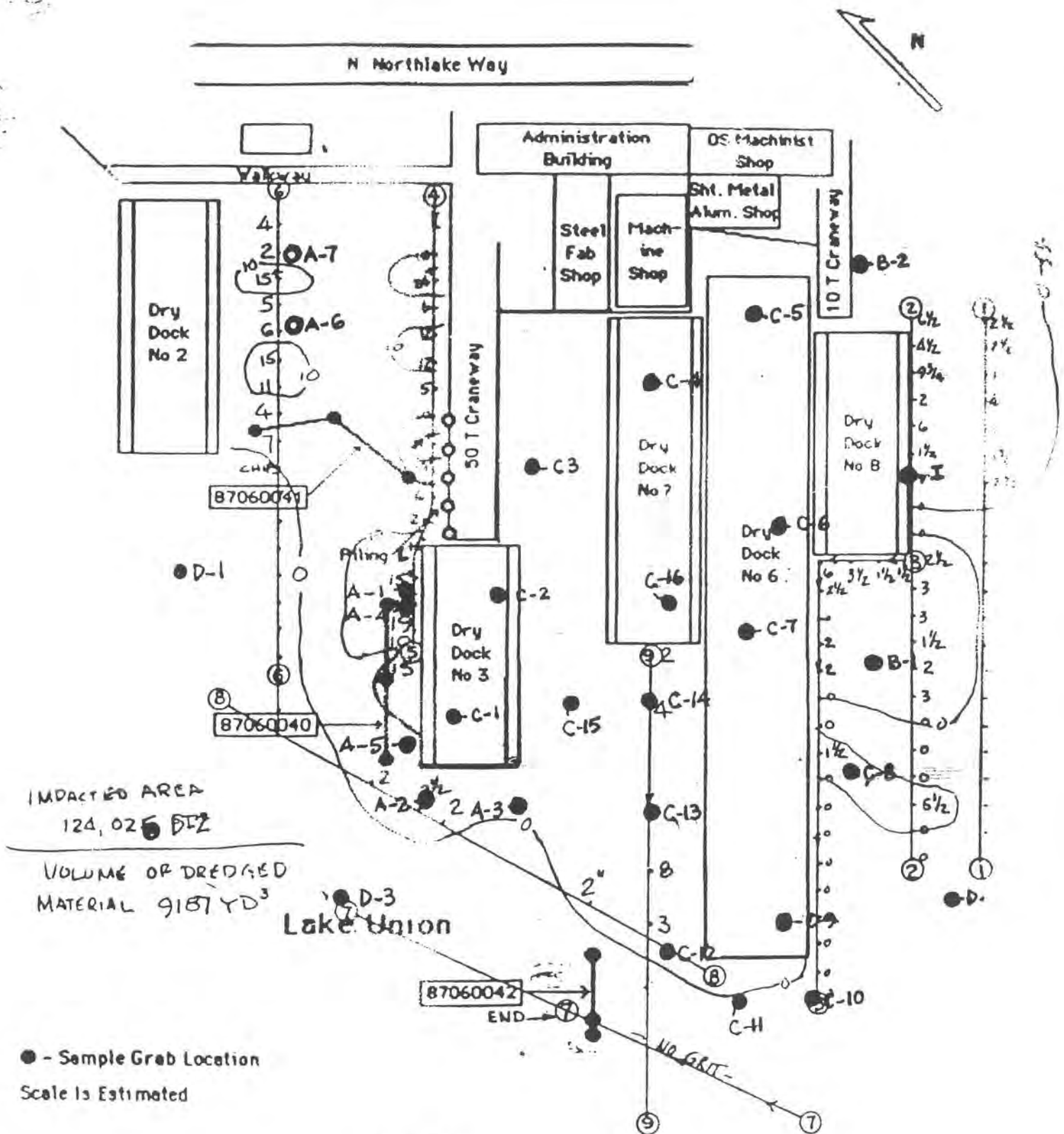


FIGURE 1



February 5, 1987

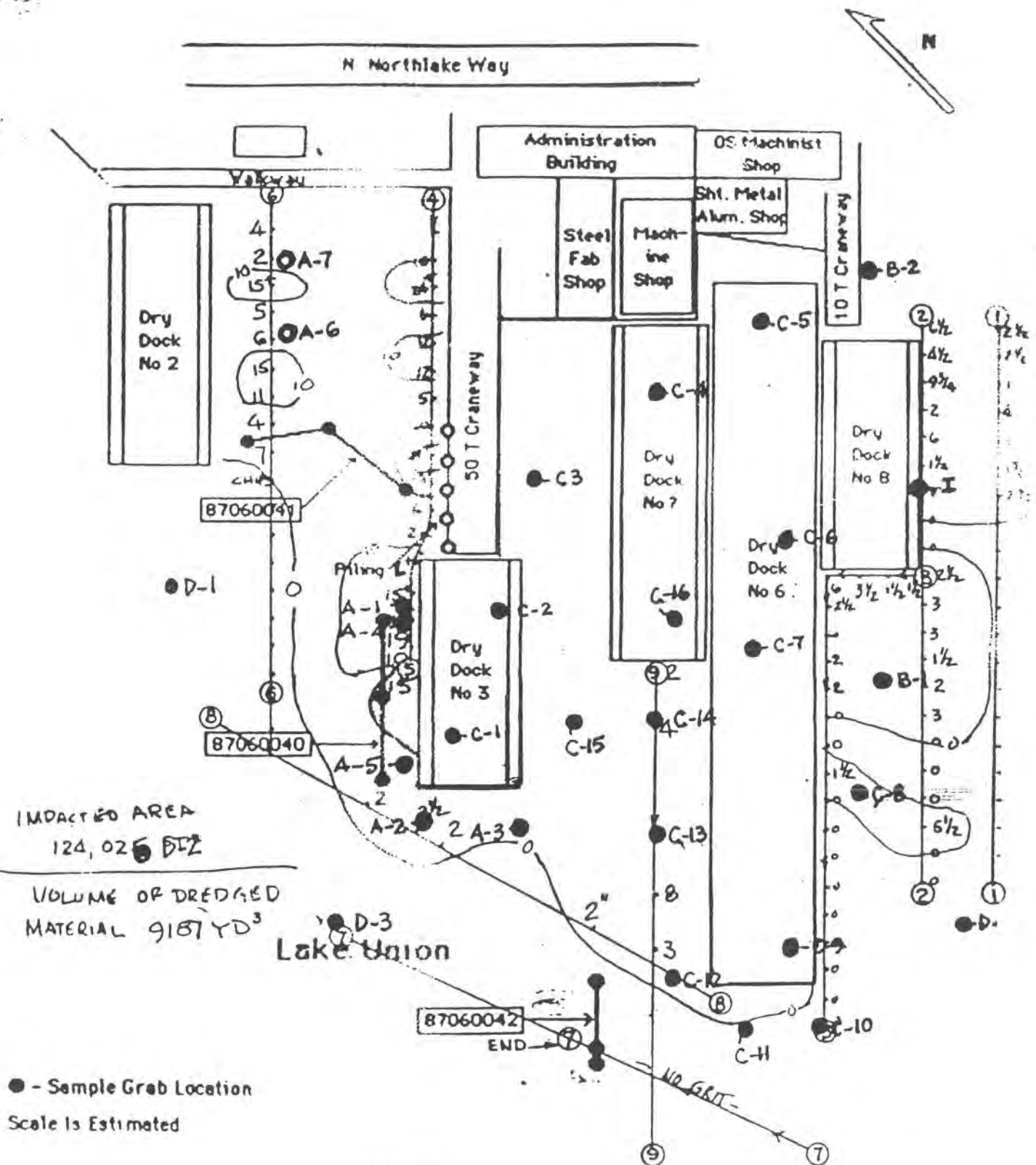


FIGURE 1